

CLAIMS**What is claimed is:**

1. A process for producing a desired hydrofluorocarbon compound having a single carbon atom comprising:
fluorinating a reactive organic compound to produce a reaction product comprising at least the desired hydrofluorocarbon compound, unreacted reactive organic compound and a hydrofluorocarbon byproduct having a boiling point between the boiling point of said desired hydrofluorocarbon compound and said reactive organic compound; and
removing from said reaction product at least a substantial portion of said byproduct to produce a product stream comprising no more than about 2 % by weight of said byproduct.
2. The process of claim 1 wherein said desired hydrofluorocarbon is difluoromethane (HFC-32).
3. The process of claim 2 wherein said reaction product comprises at least about 55 percent by weight of HFC-32 based on the total organics in the reaction product.
4. The process of claim 3 wherein said reaction product further comprises at least about 0.3 percent by weight of intermediate-boiling C1 HCC byproducts.
5. The process of claim 3 wherein said reaction product further comprises at least about 0.3 percent by weight of chloromethane (HCC-40).
6. The process of claim 5 wherein said removing step removes at least about 99 percent by weight of the HCC-40 contained in said reaction product.
7. The process of claim 6 wherein said removing step produces a product stream comprising at least about 99 percent by weight of HFC-32 and not greater than about 1 percent by weight of HCC-40.
8. The process of claim 7 wherein at least about 80 percent by weight of the HFC-32 contained in the reaction product is contained in said product stream.
9. The process of claim 7 wherein at least about 98 percent by weight of the HFC-32 contained in the reaction product is contained in said product stream.

10. The process of claim 1 wherein said removing step comprises separating from said reaction product at least a portion of the intermediate-boiling chlorinated C1 by product.
11. The process of claim 10 wherein said separating step comprises at least one distillation step.
12. The process of claim 11 wherein said at least one distillation step comprises providing a distillation tower having at least one high purity stream relatively rich in said desired hydrofluorocarbon compound, at least one stream relatively lean in said desired hydrofluorocarbon compound, and at least one intermediate boiling stream relatively rich in said intermediate-boiling chlorinated C1 by product.
13. The process of claim 12 wherein said at least one high purity stream relatively rich in said desired hydrofluorocarbon compound is an overhead stream comprising at least about 99 percent by weight of HFC-32 based on the total weight of organics in said overhead stream and wherein said at least one intermediate boiling stream comprises at least about 50 percent by weight of said intermediate-boiling chlorinated C1s.
14. The process of claim 12 wherein said overhead stream comprises at least about 99.8 percent by weight of HCC-32 based on the total weight of organics in said overhead stream and wherein said at least one intermediate boiling stream comprises at least about 50 percent by weight of HCC-40.
15. The process of claim 1 wherein said removing step comprises fluorinating at least a portion of said hydrofluorocarbon byproduct.
16. A process for producing difluoromethane (HFC-32) comprising:
 - reacting in at least a first vapor phase reaction stage a chlorine substituted single carbon compound with a fluorination agent comprising hydrogen fluoride in the presence of a fluorination catalyst to produce a reaction product comprising difluoromethane, unreacted chlorine substituted single carbon compound, fluorinating agent and chloromethane (HCC-40);

separating said reaction product stream into at least a first stream relatively rich in difluoromethane and a second stream relatively rich in unreacted chlorine substituted single carbon compound; and

reducing the concentration of chloromethane in said reaction product stream by one or more steps selected from the group consisting of: (i) fluorinating said methyl chloride in at least a second reactor stage; (ii) separating from said reaction product stream a third stream relatively rich in said methyl chloride; and (iii) combinations of (i) and (ii).

17. A process for producing difluoromethane (HFC-32) comprising:

reacting dichloromethane in at least a first catalytic, vapor phase reactor at a pressure of less than about 100 psig with a fluorination agent comprising hydrogen fluoride to produce a reaction product stream containing difluoromethane, unreacted dichloromethane, fluorination agent and byproduct comprising at least chloromethane; and

removing from said reaction product at least a substantial portion of said chloromethane to produce a first stream relatively rich in said difluoromethane, a second stream relatively rich in said unreacted dichloromethane, and a third stream relatively rich in said chloromethane.

18. The process of claim 17 wherein said removing step comprises at least one distillation step.
19. The process of claim 18 wherein said at least one distillation step comprises providing a distillation tower having an overhead stream relatively rich in said HFC-32, a bottoms stream relatively lean in said HFC-32, and at least one intermediate boiling stream relatively rich in said chloromethane.
20. The process of claim 19 wherein said overhead stream comprises at least about 99 percent by weight of HFC-32 based on the total weight of organics in said overhead stream and wherein said at least one intermediate boiling stream comprises at least about 50 percent by weight of chloromethane.
21. The process of claim 20 wherein said overhead stream comprises at least about 99.8 percent by weight of HFC-32 based on the total weight of organics in said overhead stream.

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22. The process of claim 21 wherein said removing step further comprises fluorinating at least a portion of said chloromethane.